

# Simultaneous Multiscale Design and Fabrication of Material and Structure

Presented by

**Narasimha Boddeti, Post-Doctoral Fellow, Singapore University of Technology and Design**

## Abstract

Material and structure have been traditionally treated independently in the design of structures. However, natural structures such as bone, wood, and nacre meld the concepts of material and structure with their spatially varying microstructures giving them superior fracture and impact strength. We can emulate this by integrating multiscale design and fabrication processes into a digital thread that unlocks new design freedom where the designer is no longer bound by the choice of material and geometry. We demonstrate and validate such workflows instantiated in the context of fiber-based composites and additive manufacturing. Our workflow proceeds through three key processes: 1) Design automation – conception and automation of a design problem based on multiscale topology optimization, 2) Material compilation – computational geometry algorithms that physically realize the spatially variable microstructure, and 3) Digital fabrication – additive manufacture of multiscale optimal components.

## Biography

Narasimha is currently a post-doctoral research fellow in Digital Manufacturing and Design (DMandD) center at Singapore University of Technology and Design (SUTD). He obtained his bachelor's degree in engineering from IIT, Kharagpur, India (2002-2006) and doctoral degree from University of Colorado, Boulder, USA (2009-2014). He also held a postdoctoral scholar at CU, Boulder before joining SUTD. His PhD research focused on adhesion mechanics of graphene while his current research focuses on developing design automation methods for additive manufacturing. His research interests include topology optimization, additive manufacturing, computational mechanics and architected materials.

**Tuesday, May 14th, 2019**

**11:00am to Noon**

**ETRL room 101**

Meet the speaker before the seminar in ETRL room 119, 10:30am to 10:50am. Light refreshments will be served.

